THE EFFECTS OF SIMILARITY AND DISSIMILARITY ON GROUP PERFORMANCE

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Monterey, California

THESIS

THE EFFECTS OF SIMILARITY AND DISSIMILARITY ON GROUP PERFORMANCE

by

Kent William Wells
June 1975

Thesis Advisor: C. K. Eoyang

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REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
The Effects of Similarity and Dissimilarity on Group Performance

5. TYPE OF REPORT & PERIOD COVERED
Master's Thesis; June 1975

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
Kent William Wells

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Naval Postgraduate School
Monterey, California 93940

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
Naval Postgraduate School
Monterey, California 93940

12. REPORT DATE
June 1975

13. NUMBER OF PAGES
79

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)
Naval Postgraduate School
Monterey, California 93940

15. SECURITY CLASS. (of this report)
Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
** Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
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Exercise. The results showed no significant difference in the performance of groups over five measures of effectiveness. F. E. Fiedler's Contingency Model was also tested. The results provided no support for the Contingency Model.

The Effects of Similarity and Dissimilarity on Group Performance

by

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
June 1975

ABSTRACT

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I. INTRODUCTION

It is generally believed, especially in the military services, that the performance and effectiveness of groups are largely the result of the efforts of the group leader. Consequently, most research on group performance and effectiveness has concentrated on the leader.

However, this investigator has observed that in the military many groups sustained excellent performance over periods of time regardless of the leader at any particular moment. Such an observation led to a desire to determine why some groups sustain excellent performance while experiencing periodic and fairly rapid changes in leaders (as is customary in the military) while others do not. Since, from these observations, the leader was not a constant factor, it was thought that consistent performance might be due to some psychological or sociological characteristic of the group membership.

In reviewing the literature on group effectiveness, Fiedler's Contingency Model of Leadership Effectiveness suggested a possible experimental design to examine variables which would help to explain group performance. This design would examine characteristics of group members as well as the interaction between leaders and members instead of the conventional method of examining only the characteristics of the leader.

The basic experimental design was similar to that used by investigators to test Fiedler's Contingency Model. Groups with

some particular characteristic and groups without this characteristic would be compared in the performance of a common task.

The ultimate objective of this thesis was to attempt to demonstrate that certain characteristics of the group membership could be at least as important to group performance as the characteristics of the group leader.

Any positive results of this study would indicate that formation of work groups should include consideration of the psychological and sociological characteristics of the group's membership as well as attributes of the formal leader.

II. LITERATURE SURVEY

The majority of leadership literature has concentrated on the leader--his characteristics, personality, behavior, role stability, and his impact on group productivity. [Stogdill, 1974, p. 421, 422] However, " . . . There is a scarcity of research that tests the interaction of leader personality, values, and behaviors with follower personality, values, and behaviors and the effect of such interaction upon the group." [Stogdill, 1974, p. 422]

This chapter will review the research which has examined the portions of leader-member relationships relevent to the following proposition:

> SIMILARITIES AMONG GROUP MEMBERS LEAD TO ATTRACTION AND COHESIVENESS THUS IMPROVING GROUP EFFECTIVENESS.

A. SIMILARITIES AND ATTRACTION

The general consensus of the literature supports the contention that similarity and attraction have a positive relationship.

Veitch and Griffitt (1973, p. 295) reported that, "The positive relationship between attitudinal similarity and attraction is one of the most reliable phenomena in the literature of social psychology." Veitch and Griffitt based their work on Byrne (1971). They concluded (Veitch and Griffitt, 1973, p. 296):

> It was proposed that the degree to which a target person expressed commitment to his attitudes would interact with the extent to which such

attitudes were in agreement and disagreement with those of S in determining S's attraction to the target. Results indicated the predicted interaction effect as well as a main effort for proportion of similarity.

Richardson (1940), Preker (1952), and Stotland, Zander, and Natsoulas (1961) reported that experimental subjects were attracted to and preferred those whose values were similar to their own. Fiedler, Warrington, and Blaisdell (1952), Festerheim and Tresselt (1953), Davitz (1955), Smith (1957), and Byrne and Clore (1966) showed that similarity of attitudes was a major factor when making choices in sociometric experiments. Anikeeff (1957) reported that the more dissatisfied managers were, the greater was the difference between their attitudes and those of the workers. Heider (1958) and Newcomb (1961) developed and tested a theory that persons with similar attitudes were attracted to each other. Such a theory was an extension from Sullivan (1947) that persons were motivated by a need for consensual validation; that is, people tried to validate their attitudes by seeking agreement with others. In an experimental study, French (1956) reported that when selecting partners for subsequent tasks, achievement-oriented individuals selected previously successful partners to a significant degree. In a similar experimental situation, Marwell (1966) reported that subjects tended to pick partners who had cooperated previously in spite of like or dislike of the person. Mitchell (1968) reported that top managers rate subordinates as more effective when these subordinates' attitudes and values more closely resembled their own.

There has been research, however, that has examined differences rather than similarities as the basis for attraction. Based primarily on studies on mate selection, Winch (1958), supported by Kerchkoff and Davis (1962), proposed that the " . . . need structure of persons attracted to each other is different or complementary rather than similar." [Secord and Backman in Luthans, p. 311] Other studies, however, failed to support Winch: Bowerman and Day (1956), Schellenberg and Bee (1960), Murstein (1961), and Hobart and Lindholm (1963). More recent literature has continued to conclude that similarities cause attraction: Johnson and Johnson (1972), Good and Nelson (1973), and Singh (1973).

B. SIMILARITIES AND COHESION

The general consensus of the research performed supports the contention that attraction and cohesion are closely related.

Lemann and Solomon (1952) found, " . . . that accuracy of interpersonal perception was higher in cohesive groups than in uncohesive groups." [Stogdill, 1974, p. 102] In a study of eight organized groups with elected leaders and eight unorganized groups, French (1941) showed that the unorganized groups demonstrated a greater tendency to break into factions. The organized groups were characterized by greater social freedom, cohesiveness, motivation, interdependence, frustration, interpersonal aggression, and quality of participation. Organized groups, as opposed to unorganized groups, provide members with greater individual freedom, more cohesiveness and increased

effectiveness. Good and Nelson (1973, p. 551) reported that the, " . . . evaluation of group cohesiveness is a positive function of similarity of intra-group attitude or the similarity of the group's members to one another . . . " Zander and Medow (1965) reported that members' desires for group success is strengthened by a high degree of cohesiveness. Lerner and Becker (1962), in a study of two-person groups in competitive tasks, found that partners preferred to be similar if both could win, but dissimilar if one could win and the other lose. Festinger (1954) has suggested that a group member tends to compare himself to others most similar to himself in opinion and ability. When there is a disagreement, the individual tends to move toward the group norm. Schachter (1951) reported that extreme deviates tend to be rejected by group members. "With group cohesiveness held constant, rejection of the deviate is greater in relevant than in irrelevant groups. With relevance held constant, the deviate's mean sociometric position indicates greater rejection in high-cohesive than low-cohesive groups." [Stogdill, 1974, p. 206]

C. COHESION AND GROUP EFFECTIVENESS

There appears to be little consensus on the relationship between cohesiveness and productivity. Stogdill (1959) indicated that, " . . . There can be a positive relationship between cohesiveness and productivity . . . ," but cautioned that the high motivational conditions required, " . . . can seldom be maintained hour after hour, day after day." [Stinson and Hillebrandt, 1972, p. 100] On the other hand, Stinson and

Hillebrandt (1972) found no significant association between cohesiveness and productivity. Schachter, Ellerton, McBride, and Gregory (1951) found that productivity was not affected by the group's degree of cohesiveness when under pressure for production. Flint, Bass, and Pryer (1957) found that "groups are more effective, but less cohesive, when high-status members are more highly regarded than low-status members." [Stogdill, 1974, p. 330] Seashore (1954) found, " . . . that under leader support of followers, group cohesiveness is related to high productivity. Under weak leader support, however, high cohesiveness is related to low productivity." [Stogdill, 1974, p. 356]

1. Homogeneous-Heterogeneous Groupings

Lampkin (1972, p. 189), in an experiment with high and low n-dominance subjects, " . . . showed heterogeneous groups significantly better at organizing their group communications process. They subsequently performed the task more efficiently than homogeneous triads." Hoffman (1959) reported that, " . . . higher quality solutions to problems were produced by groups whose members had dissimilar personalities." [Reddy and Byrnes, 1972, p. 516] Hoffman and Meier (1961) confirmed Hoffman's 1959 findings that heterogeneous groups are relatively superior to homogeneous groups.

2. Compatibility

However, several researchers have come to different conclusions. Pryer, Flint, and Bass (1962) reported that early agreement on who should be the leader led to increased group effectiveness in highly motivated groups. Rosen (1959)

concluded that the greater the consensus for a leader, the greater was cohesiveness and productivity. Reddy and Byrnes (1972, p. 516) concluded that, "Groups that were more compatible on the interpersonal dimensions of control and affectation completed the task more rapidly than more incompatible groups." Shultz (1958) " . . . has presented evidence of greater goal achievement in more versus less compatible groups." [Reddy and Byrnes, 1972, p. 516] Anderson (1961) has suggested that time is needed for groups to learn to work together. Reddy and Byrnes (1972, p. 517) concluded:

> The results suggest that when compatible groups are given time to organize and to develop their interpersonal skills, they are more effective than incompatible groups involving concrete tasks.
>
> It may be that incompatible groups exhibit initial problem-solving effectiveness, but that over time, compatible groups are superior.

Ghiselli (1966) observed that poor initial performance was associated, among other factors, with strong group cohesiveness.

3. Identification

In addition to similarities, identification is another factor related to group effectiveness. Barnes (1960) found that exclusive identification with a membership group may not be an advantage to that group. Cohen (1957), on the other hand, reported a positive correlation between group effectiveness and identification with the group as a reference group.

4. Roles

Another factor in cohesiveness is role perception. Haythorn (1954) reported that, " . . . variance in bomber crew performance and cohesiveness was highly related to the extent

to which the aircraft commander performed the informal leadership roles usually expected of the formal group leader." [Stogdill, 1974, p. 297] Several studies, Slater (1955), Dunphy (1963), Bales and Slater (1955), Harrell and Gustafson (1966), and Theodorson (1957), reported that the roles of the task leader and social leader are combined in cohesive groups, while remaining separated in uncohesive groups. E. E. Smith (1957), in work with experimental groups, found that productivity and satisfaction were related to the degree that roles were clearly established in the group. Naylor and Dickinson (1969) reported that task structure is positively related to group effectiveness. Hickson, Pugh, and Pheysey (1969) reported that, " . . . The structure of activities, role specialization, and functional specialization were positively and significantly correlated with group size and productivity." [Stogdill, 1974, p. 298] Katz, Maccoby, Gurin, and Floor (1951) found that in railroad section groups, supervisors of high producing groups, "tended to exercise the leadership role rather than relinquish it to members of the work group. [Stogdill, 1974, p. 376]

D. LEADER-MEMBER RELATIONS: PRODUCTIVITY AND EFFECTIVENESS

Researchers have found that productivity and cohesiveness have a slight positive correlation with leadership style. Further, researchers have found a positive relationship between productivity and leadership style. (See Table I, p. 22) Some of the factors affecting productivity are: psychological and social distance, leadership personality traits, leaders'

behaviors and orientations, and the least-preferred coworker scale (LPC).

1. Psychological and Social Distance

Fiedler (1967), supported by Rubin and Goldman (1968) and Carp, Vitola, and McLanathan (1963), showed that effective performance is highly "related to a type of leader which perceives and maintains a relatively high degree of psychological distance between leader and follower, not so close that supervisors are hampered by emotions, or so distant that they are divorced from emotional contact." [Stogdill, 1974, p. 250] Burke studied different combinations of leaders and followers, differentiating them on the basis of social distance and need for achievement.

> High need achievement followers were more comfortable under high social distance while low need achievement followers were most comfortable under low social distance. Followers with a high social distance leader rated their groups as less productive than those under low social distance leaders. High social distance leaders were rated more effective in a coding task, and low social distance leaders were rated more effective in a human relations task.
>
> [Stogdill, 1974, p. 251]

2. Leadership Personality Traits

Litwin (1968) found that in experimental groups, those groups with leaders high in need for achievement were more productive than those leaders high in need for affiliation or power. Bass (1967) observed that task-oriented followers produced greater quantities of work under persuasive leadership. Further, " . . . Interaction-oriented followers produced both high quantities and quality of work under coercive leadership." [Stogdill, 1974, p. 356] Bass and Dunteman (1963) worked with

sensitivity training groups and studies task-oriented, interaction-oriented, and self-oriented subjects. "Interaction-oriented members tended to be most satisfied in homogeneous groups with interaction-oriented leaders." [Stogdill, 1974, p. 356] Ashour and England (1972) found that a leader's dominance was negatively related with his willingness to delegate authority. However, the degree of leader's authoritarianism had no relation to his willingness to delegate authority.

3. Leaders' Behaviors and Orientations

Holder (1954) obtained results which indicated that the more a leader's behavior conformed to member expectations, the greater was group productivity. Havron and McGrath (1961) suggested that highly effective groups have leaders that either behave as expected or have induced the group members to form norms in consonance with their behavior. Cooper (1966) reported that workers tend to pattern their behavior after the behavior of their supervisor. In addition, "Leaders high in task relevance supervised groups in which workers made fewer errors in their work and exhibited lower rates of absenteeism and tardiness than was true for groups with leaders low in task orientation." [Stogdill, 1974, p. 356-357] Horsfall and Arensberg (1949) found no relation between productivity and the degree of interaction by supervisors. Katz, Maccoby, and Morse (1950) observed that higher producing sections of office workers had supervisors who were higher in employee orientation than those supervisors of low producing sections. Roberts, Miles, and Blankenship (1968) found that group performance was

higher when the supervision was employee oriented rather than a more disinterested style. Weitz and Nuckols (1953) found no relation between group productivity and supervisors' test scores on a test measuring human relations orientation. Likert (1961) obtained, " . . . results tending to support the hypothesis that a supportive attitude toward men and belief in the group method of supervision, combined with high group loyalty and attitude toward management, is associated with increased productivity and desire for responsibility. With the introduction of a human relations approach to management, along with high performance goals, productivity increased steadily." [Stogdill, 1974, p. 378-379]

4. Least Preferred Coworker Scale (LPC)

Fiedler (1967), in a review of his research on the relationship of leadership to productivity, listed a great variety of sample populations and explained the method and purpose of his LPC scale. Those receiving high LPC scores were described as being high in consideration; those with low LPC scores were described as task oriented. Graham (1973) concluded, " . . . that LPC measures a triggered behavioral disposition reflecting the degree to which leaders are responsive to task-oriented feedback." Low LPC leaders tend to be more effective in situations either highly favorable or unfavorable to the leader. High LPC leaders obtain more effective group performance in situations moderately favorable for the leader. Graen, Orris, and Alvares (1971) and Graen, Alvares, Orris, and Martella (1970) failed to confirm Fiedler's findings. Fiedler

criticized this research as not differentiating enough between favorable and unfavorable situations for a valid test. "Research on work groups uniformly supports Fiedler's hypothesis, while experimental group research is less supportive." [Stogdill, 1974, p. 335] "Research in support of Fiedler's hypothesis that low social distance is negatively correlated (see page 18 above) to group productivity . . . " [Stogdill, 1974, p. 385] has been reported by: Fiedler (1954, 1955, 1966, 1967), Fiedler and Meuwese (1963), Fiedler, Meuwese, and Oonk (1961), Fiedler, O'Brien, and Ilgen (1969), Burke (1965), Cleven and Fiedler (1956), Hawkins (1962), Hill (1969), Hunt (1967), Hutchins and Fiedler (1960), Julien (1964), and Sample and Wilson (1965). Sorcher (1966) found no relation between distance and group productivity while Ziller (1963) obtained supportive results. In a summary of 18 studies examining the relationship between group productivity and social distance, Stogdill found 16 with positive correlations and only one with a negative correlation. [Stogdill, 1974, p. 385]

> Several forms of person-oriented leader behavior have been identified. Democratic, permissive, participative, follower-oriented, and considerate patterns of behavior are often treated as synonymous; however, the conceptualizations of these patterns differ considerably. Some are differentially related to productivity and satisfaction. Similarly. the various forms of work-oriented leadership (autocratic, restrictive, distant, directive, and structured) are often regarded as interchangeable. But they also exhibit conceptual differences and do not exert identical effects on member satisfaction or on group productivity and cohesiveness.
> [Stogdill, 1974, p. 403]

TABLE I

Number of Positive, Zero, and Negative Relationships Between Leader Behavior and Group Productivity

Variables Related to Productivity	Direction of Relationship Positive	Zero	Negative
Democratic	3	11	
Permissive	7	3	4
Follower-oriented	19	5	4
Participative	10	5	3
Considerate	8	8	3
	47	32	14
Autocratic	3	10	1
Restrictive	2	3	1
Task-oriented	3	3	3
Socially distant	16	1	1
Directive	10	4	1
Structured	13	5	
	47	26	7

Table I is a summary of the major research studies examining the relationship between leadership and group productivity.

(Table I from Stogdill, 1974, p. 404)

TABLE II

Number of Positive, Zero, and Negative Relationsips Between Leader Behavior and Group Cohesiveness

Variables Related to Cohesiveness	Direction of Relationship Positive	Zero	Negative
Democratic	2	1	
Permissive	2	1	3
Follower-oriented	3		2
Participative	8	2	1
Considerate	5	1	
	20	5	6
Autocratic		1	2
Restrictive		1	
Socially Distant	1	1	
Directive	2	1	1
Structured	6		
	9	4	3

Table II is a summary of the major research studies examining the relationship between leadership and cohesiveness.

(Table from Stogdill, 1974, p. 406)

III. STATEMENT OF HYPOTHESES

As noted in the previous section, the majority of leadership research has concentrated on the characteristics and behavior of the leader. Stogdill (1974, p. 422) called for research focusing on the interaction between leader and follower traits and the impact of these interactions on group productivity and effectiveness. It is agreed that an examination of aspects of leader-member relations and consequent interactions is required, and this thesis presents a model based on such interactions.

A. SIMILARITY HYPOTHESIS

The literature survey has indicated that compatibility/cohesiveness can have an impact on productivity and effectiveness. The process which appears to occur is summarized as follows:

Similarities of characteristics--physical, psychological, and behavioral--creates intra- and inter-group attraction. Persons and groups who are attracted toward each other tend to form more cohesive groups than groups whose affiliation is not based on personal and inter-group attraction. The degree of cohesiveness of groups may well affect the relative effectiveness of groups based on similarities versus groups based on dissimilarities. It is hypothesized that:

GROUPS WHICH ARE BASED ON SIMILAR PERSONALITY TRAITS WILL BE MORE EFFECTIVE THAN THOSE GROUPS IN WHICH MEMBERS ARE NOT SIMILAR ON PERSONALITY TRAITS.

B. CONTINGENCY MODEL

Fiedler's Contingency Model of Leadership Effectiveness is one of the most prominent in the field. It is proposed that predictions made from the Similarity Hypothesis just presented be compared with those made from Fiedler's Contingency Model.

In brief, Fiedler maintains that the degree of situational favorableness, plus the motivation base of the leader as measured by the Least Preferred Coworker (LPC) scale, determines leadership, hence group, effectiveness. Using the LPC measure for leaders and by determining the situational favorableness as depicted in Figure 1, page 30, Fiedler makes the following basic predictions:

1. High LPC leaders do well in moderately favorable situations (Octants III to VI, Figures 1 and 2).

2. Low LPC leaders do well in very favorable and very unfavorable situations (Octants I, II, VII and VIII, Figures 1 and 2).

Among the variables Fiedler claims influence situational favorableness is leader-member relations. [Fiedler and Chemers, 1974, p. 64-66] Based on the Similarity Hypothesis, it was assumed by the investigator that cohesiveness included leader-member relations. Further, it is argued that since the degree of similarity directly affects the degree of cohesiveness, the overall results will be an improvement of leader-member relations. Therefore, increasing similarity should increase situational favorableness. Since the LPC scale is a major feature of

Fiedler's Contingency Model, it is proposed that the variable to be manipulated in the testing of the Similarity Hypothesis be the LPC. Obviously, there are many other dimensions of personality that could be examined, but the LPC is selected for this initial study. The experiment requires that LPC scores for leaders and members be determined and that the individuals be both matched and mismatched in work groups. Empirical date will then be collected to determine the effect of the similar and dissimilar groups on group performance.

C. THE SIMILARITY HYPOTHESIS MODEL

The basic model, MATRIX I, is a two-by-two matrix with the member LPC on the vertical axis and the leader LPC on the horizontal axis (Figure 3, p. 32).

A key question in determining the situational favorableness in each cell of the matrix is how much improvement of leader-member relations results from the matching and mismatching of leader-member LPC scores. Selecting the task with low task structure and weak position power would cause the situational favorableness to be either in Fiedler's Octant IV (Figure 1) with good leader-member relations, or in Octant VIII (Figure 1) with poor leader-member relations. The effect of varying the leader-member relations according to the Similarity Hypothesis could result in three situations represented by three models (Figure 4, p. 33).

MATRIX II represents leader-member relations which are not improved or degraded significantly to affect the situational favorableness. From MATRIX II, the predictions of

group effectiveness by the Similarity Hypothesis and by Fiedler would be as follows:

1. Similarity Hypothesis: Cell 1 would be superior to Cells 2 and 3, and Cell 4 would be superior to Cells 2 and 3. Groups which have been matched as to leader-member LPC are predicted to perform better than those groups which are mismatched.

2. Fiedler: Cell 1 would be superior to Cells 2 and 4 and Cell 3 would be superior to Cells 2 and 4. Since the situational favorableness in all cells is moderate, Fiedler would predict that high-LPC-leader groups would perform better than groups with low LPC leaders.

A conflict occurs between the predictions in that the Similarity Hypothesis predicts Cell 4 to be superior to Cell 3, but Fiedler predicts Cell 3 to be superior to Cell 4.

MATRIX III represents leader-member relations which are affected to the degree that the similarity grouping has no effect on the situation, and dissimilarity degrades leader-member relations to unfavorableness. From MATRIX III, the predictions of group effectiveness by the Similarity Hypothesis and by Fiedler would be as follows:

1. Similarity Hypothesis: Cell 1 would be superior to Cells 2 and 3 and Cell 4 would be superior to Cells 2 and 3. Groups with members who have been matched as to leader-member LPC are predicted to perform better than those groups which are mismatched.

2. Fiedler: Cell 1 would be superior to Cells 3 and 4 and Cell 2 would be superior to Cells 3 and 4. The high LPC leader is predicted to perform better in a moderately favorable situation than a high LPC leader in an unfavorable situation or a low LPC leader in a moderately favorable situation; the low LPC leader is predicted to perform better in an unfavorable situation than a high LPC leader in an unfavorable situation or a low LPC leader in a moderately favorable situation.

A conflict between the predictions occurs in that the Similarity Hypothesis predicts that Cell 4 will be superior to Cell 2, but Fiedler predicts Cell 2 will be superior to Cell 4.

MATRIX IV represents leader-member relations which are degraded to the degree that situational favorableness in all Cells is unfavorable. From MATRIX IV, the predictions of groups effectiveness by the Similarity Hypothesis and by Fiedler would be as follows:

1. Similarity Hypothesis: Cell 1 would be superior to Cells 2 and 3, and Cell 4 would be superior to Cells 2 and 3. Groups which have been matched as to leader-member LPC are predicted to perform better than those groups which are mismatched.

2. Fiedler: Cell 2 would be superior to Cells 1 and 4, and Cell 3 would be superior to Cells 1 and 4. Since the situational favorableness in all Cells is unfavorable, Fiedler would predict that low LPC leaders would perform better than high LPC leaders.

A conflict between the predictions occurs in that the Similarity Hypothesis predicts Cell 1 would be superior to Cell 2, but Fiedler predicts Cell 2 would be superior to Cell 1.

D. AN ALTERNATIVE HYPOTHESIS: THE DISSIMILARITY HYPOTHESIS

An alternative hypothesis, as supported by Stinson, Ellerston, Flint, Stogdill, et. al., is that groups comprising dissimilar personalities will be more effective. Using this Dissimilar Hypothesis, the situational favorableness represented by MATRIX III would be reversed and the predictions based on the Dissimilarity Hypothesis would be the opposite of those based on the Similarity Hypothesis. Although the situational favorableness for MATRICES II and IV would remain the same, the predictions based on the Dissimilarity Hypothesis would be the reverse of the predictions based on the Similarity Hypothesis. Thus this thesis examines these two competing hypotheses as well as testing Fiedler's Contingency Model.

FIGURE 1

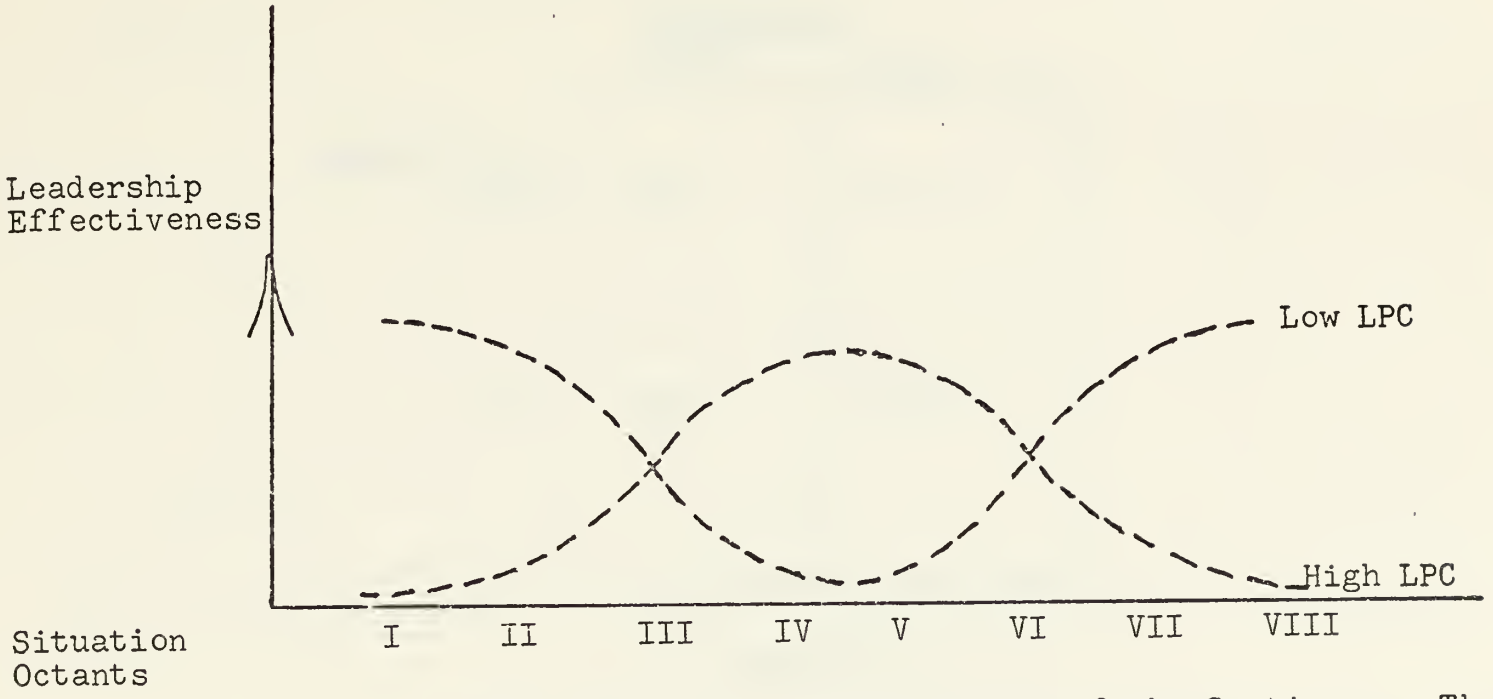
Contingency Theory - Situational Favorableness

GOOD				POOR				Leader-Member Relations
HIGH		LOW		HIGH		LOW		Task Structure
STNG	WK	STNG	WK	STNG	WK	STNG	WK	Position Power (Strong-Weak)
I	II	III	IV	V	VI	VII	VIII	Situational Favorableness Octants

Very Favorable — Moderately Favorable — Very Unfavorable

FIGURE 2

Contingency Theory
Comparison of Leadership Effectiveness in Different
Situational Favorableness Octants



This graph is a representation of the Contingency Theory.
It is not intended to reflect actual data.

TABLE 3

Similarity Hypothesis

BASIC MODEL

MEMBER LPC \ LEADER LPC	HIGH	LOW
HIGH	CELL 1	CELL 2
LOW	CELL 3	CELL 4

MATRIX I

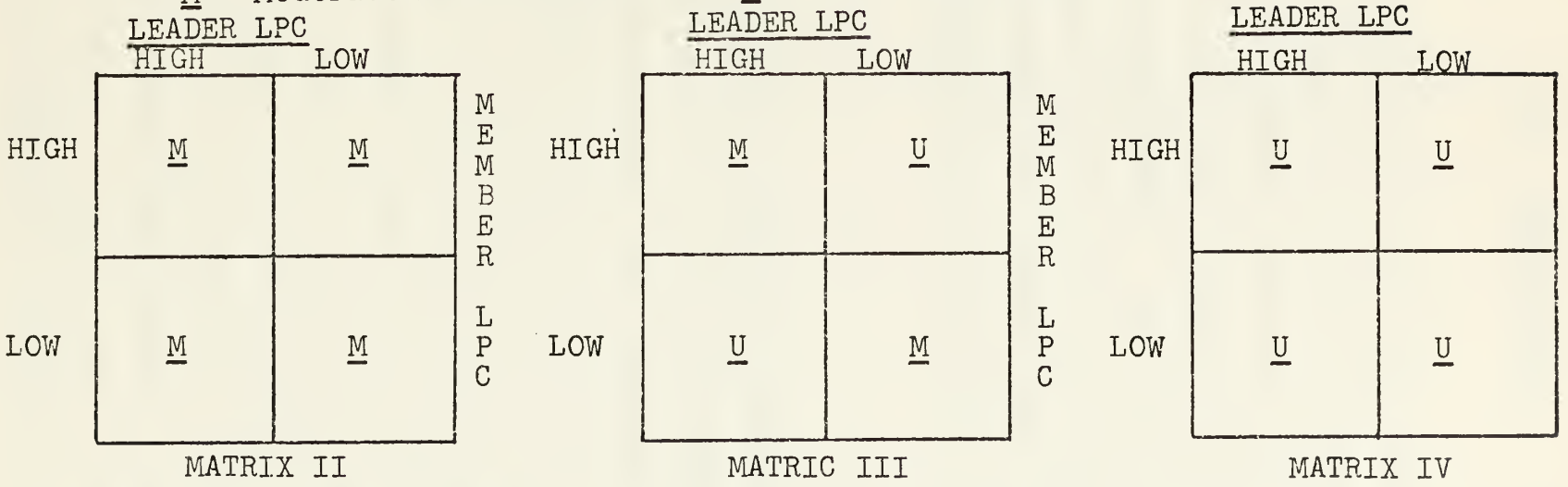
FIGURE 4

Similarity Hypothesis

Possible Situational Matrices Based on

Similarity/Dissimilarity Groupings

M = Moderate Favorableness U = Unfavorableness



Similarity/Dissimilarity has no effect on situational favorableness

Similarity has no effect on situational favorableness. Dissimilarity degrades favorableness

Similarity/Dissimilarity degrades situational favorableness

IV. METHODOLOGY

A. SUBJECTS

One-hundred-nineteen Subjects (Ss) were selected from 145 U. S. Naval and three allied military officers attending the Naval Postgraduate School in Monterey, California. Ss were chosen from the total of 148 students taking a required course in Human Resources Management. This particular course was chosen as a source for Ss because it provided the best representative cross section of students from all curriculums. The source for Ss comprised nine classes with the total of 148 students.

B. PROCEDURE

Fiedler's LPC Scale (Appendix C) was given to the 148 students. Once the mean for the total sample was determined (mean = 63.12), individuals were designated as high LPC if their score was above the mean and low LPC if their score was below the mean. Of the 148 scores in the sample there were 119 usable responses due to the LPC distribution among the nine classes. The unused Ss could not be placed in experimental groups with the desired LPC configuration and were used as observers for a group dynamics discussion.

The LPC survey was given during a class period prior to the experimental period (Distribution and group means contained in Appendices E and F). Group leaders in each class were selected from the highest and lowest LPC's available. The low

LPC leaders ranged from a score of 16 to 52. High LPC leaders ranged from a score of 72 to 105. The high LPC leaders were randomly assigned within their classes to groups numbered 1-7 and 14-21. (See Figure 5, p. 36) The fifteen low LPC leaders were randomly assigned to groups numbered 8-13 and 22-30. High LPC members were randomly assigned to groups numbered 1-13 and low LPC members were assigned to groups numbered 14-30. In this way, a total of 30 groups were formed matching high LPC leaders with high LPC members, high LPC leaders with low LPC members, low LPC leaders with high LPC members, and low LPC leaders with low LPC members.

C. THE TASK

The NASA Moon Survival Task was used as the experimental test for the work groups. (See Appendix A) Briefly, the exercise consists of ranking fifteen items in relative priority for astronauts who have crash landed on the moon. Exercise score is based primarily on individual and group rank-orders compared with NASA's official ranking.

Using Fiedler's criteria for judging task structure [Fiedler and Chemers, 1974, p. 66-68] this problem was judged to have:

1. median goal clarity (5 on a 1-8 scale)
2. low goal-path multiplicity (1 on a 1-8 scale)
3. low decision verifiability (1 on a 1-8 scale)
4. high decision specificity (8 on a 1-8 scale)

$15 \div 4 = 3.75$, hence low task structure

FIGURE 5

Similarity Hypothesis

Group Assignments to Cells by LPC

LEADER LPC

MEMBER LPC	HIGH		LOW	
HIGH	Group 1	Group 5	Group 8	Group 11
	Group 2	Group 6	Group 9	Group 12
	Group 3			
	Group 4	Group 7	Group 10	Group 13
LOW	Group 14	Group 18	Group 22	Group 25	Group 28
	Group 15	Group 19	Group 23	Group 26	Group 29
	Group 16	Group 20			
	Group 17	Group 21	Group 24	Group 27	Group 30

Using Fiedler's criteria for judging leader's position power [Fiedler and Chemers, 1974, p. 68-69], position power was kept purposely weak.

1. The leader held no reward or punishment capability either on his own or as the result of his recommendations to a superior.

2. The leader had no impact on members' promotions or demotions.

3. The leader had no special knowledge.

4. The leader did have some capability to instruct group members concerning what they were to do, but only relating to filling out forms.

5. The leader was given no special instructions or directions to motivate his group members.

6. The leader had the same knowledge of the task as his group members and was an equal member as far as determining a group consensus.

7. The leader had no special knowledge or skills enabling him to supervise or evaluate subordinate jobs.

8. The nature of the task was such that the leader could not perform the work of any one of the group members. However, the leader could have completed the group consensus on his own.

9. The "title" given to the leader was kept low key and was termed "group administrative coordinator."

With task structure low and position power weak, the third dimension of Fiedler's situational favorableness to determine

was leader-member relations. Within the context of the Similarity and Dissimilarity Hypotheses, it was considered that the similarity or dissimilarity of the group composition would influence leader-member relations. The resulting situational favorableness would be as described on pages above. As a further test of leader-member relations, a group atmosphere (GA) scale was given. [Fiedler and Chemers, 1974, p. 65] (See Appendix D)

A NASA Exercise pre-ranking was administered to all students participating in the experiment prior to their assignment to work groups. The purpose of the pre-ranking was to determine individual task performance before the group performance of the task. Standardized verbal instructions were given, and the exercise was begun. Ten minutes were allotted for the completion of the pre-ranking phase. After the pre-ranking phase, group assignments were made and the "group administrative coordinator" was designated. Each group went to a separate work area with the assignment to come to a consensus group answer to the NASA Moon Survival problem. Thirty minutes were allotted for the group consensus phase. Group members retained their pre-rankings and were allowed to refer to it during the group consensus phase. At the end of the group consensus phase, each group member, including the leader, completed a post-ranking. Group members were allowed to refer both to their pre-ranking and group ranking during this phase. About five minutes were allotted for the post-ranking phase. After the completion of the post-ranking phase, the

group atmosphere (GA) scale was given. All forms were then collected by the investigator.

D. SCORING

The solution to the NASA Task is a rank ordering. Therefore, the Spearman rank-order correlation coefficient was used as the basic method for comparing the following pairs of ranks:

1. Group ranking with the official NASA ranking.
2. Individual pre-ranking with the NASA ranking.
3. Individual post-ranking with the NASA ranking.
4. Individual pre-ranking with the individual post-ranking.
5. Individual pre-ranking with the group ranking.
6. Individual post-ranking with the group ranking.

The Group Atmosphere and the LPC were scored in standard fashion, summing the score of the eight-point, bipolar scales.

E. MEASURES OF EFFECTIVENESS

Given the nature of the NASA Moon Survival Task, there were alternative measures of effectiveness. For each hypothesis concerning group performance, there were several ways to evaluate this performance. The measures used were as follows:

1. Group ranking correlated with the NASA solution (Group/NASA): This correlation gives the technical accuracy of the Group ranking.

2. The individual's post-ranking correlated with the group ranking (Post/Group): This correlation indicates the degree of agreement between the group and the individual. The closer the individual's post-ranking was to the group ranking, the higher the agreement with the group decision.

3. The difference between the individual's post-ranking correlation and his pre-ranking correlation (Post/NASA minus Pre/NASA): This score indicates the amount of technical change in the individual as a result of the group discussion, and therefore, the value of the group discussion to the individual.

4. The difference between the individual's Post/Group correlation and his Pre/Group correlation (Post/Group minus Pre/Group): This difference indicates the amount of individual movement from his first, private ranking toward the group consensus.

5. Group Synergy: This measured whether the technical accuracy of the group was superior to that of the individuals in the group. Work groups were scored from 0 to 4 points depending on the number of individuals whose Pre/NASA correlation was greater than the Group/NASA correlation. For example, a group that did better than all of its individuals scored zero.

F. STATISTICAL ANALYSIS

Significant difference among the work group scores for the five Measures of Effectiveness (MOE's) were analyzed by the Kruskal-Wallis analysis of variance by ranks.

[Hays, 1973, p. 782-784] A non-parametric test was chosen due to the lack of a true interval scale resulting from the rank-order correlation coefficients which were used as individual and group scores.

The various groups that were compared using the Kruskal-Wallis analysis are the four possibilities resulting from the original two-by-two matrix model (MATRIX I): columns, rows, diagonals, and the four individual cells. Analysis by columns compared groups with high LPC leaders with groups with low LPC leaders. Analysis by rows compared with high LPC members with groups with low LPC members. Analysis of diagonals compared groups that were homogeneous (high LPC leaders/members and low LPC leaders/members) with groups that were heterogeneous (high LPC leaders with low LPC members and low LPC leaders with high LPC members). Analysis of the individual cells compared each cell with the others.

V. RESULTS

The summary of group and individual performance data is contained in Appendix F.

A. RESULTS BASED ON GROUP SIMILARITY AND DISSIMILARITY

The Similarity Hypothesis predicted that groups of leaders and members with similar LPC's would be superior to groups of leaders and members with dissimilar LPC's. The results did not show significant differences between similar and dissimilar groups as measured by the five MOE's: (technical accuracy of the group, group influence on the individual, technical improvement of individuals, amount of individual change, and degree of group synergy). Therefore, neither the Similarity Hypothesis nor the Dissimilarity Hypothesis for LPC is supported by the data.

Applying Fiedler's Contingency Model to the same data and to the same MOE's, the results showed no significant difference between the performance of groups with high LPC leaders and groups with low LPC leaders. Therefore, the results provided no support for Fiedler's Contingency Model of Leadership Effectiveness.

B. RESULTS BASED ON GROUP ATMOSPHERE

The Similarity Hypothesis predicted that similar groups would have better leader-member relations than dissimilar as measured by GA. The results did not support this prediction.

Alternatively, the Dissimilarity Hypothesis predicted that dissimilar groups would have better leader-member relations as measured by GA. The results did not support this prediction.

It was noted that there was no significant difference among the four cells in the two-by-two matrix when arranged by leader and member LPC's. A total sample GA mean was computed and another two-by-two matrix was constructed by leader LPC and high GA (groups scoring among the mean) and low GA (groups scoring below the mean). This realigned matrix was then analyzed for difference between groups with high LPC leaders and groups with low LPC leaders. The new matrix configuration is shown in Figure 6, p. 44. It was noted that if leader-member relations were good, and taking into account the low task structure and weak position power setting of the experiment, overall situational favorableness would be moderately favorable (Octant IV of Fiedler's Contingency Model). Similarly, if leader-member relations were poor, overall situational favorableness would be very unfavorable (Octant VIII). According to the Contingency Model, Cell 1 would be superior to Cells 2 and 3 and Cell 4 would be superior to Cells 2 and 3. The data showed no significant difference between the performance of the various cells as measured by the five MOE's. Therefore, the results again failed to support the Contingency Model of Leadership Effectiveness.

FIGURE 6

Group Assignment to Cells by Group Atmosphere

LEADER LPC

Situational Favorableness Octants	HIGH		LOW	
OCTANT IV	Group 1	Group 15	Group 10	Group 23
	Group 5	Group 16	Group 11	Group 24
	Group 6	Group 17	Group 12	
	Group 14	Group 19	Group 22	Group 30
OCTANT VIII	Group 2	Group 18	Group 8	Group 26
	Group 3	Group 20	Group 9	Group 27
	Group 4		Group 13	Group 28
	Group 7	Group 21	Group 25	Group 29

C. INTERPRETATION OF RESULTS

The lack of significant differences among the various group comparisons by five measures of effectiveness for all hypotheses can be interpreted in different ways.

1. The data and results represent the true state of nature. This interpretation implies that among Naval officers, LPC is not a personality variable of group leaders or members that has significant impact on group effectiveness.

2. The data and results may NOT represent the true state of nature because the experimental design might not have been able to detect actual differences among the groups. This interpretation implies that among Naval officers, LPC is a personality variable which could have significant impact on group effectiveness, but the experimental design needs to be altered. In redesigning this research, the following considerations are appropriate.

a. The statistical method may not have been sufficiently sensitive to detect differences. The lack of interval data required the use of a non-parametric test. Among the non-parametric tests available, the Kruskal-Wallis analysis seemed most appropirate for the rank-order nature of the raw data. Further, the Kruskal-Wallis analysis allowed for a variable number of comparison groups while other methods, (e.g., Mann-Whitney) were designed for the comparison of two groups only. In addition, it could be aruged that important differences should be discoverable even with relatively weak tests and experiments.

b. The measures of effectiveness may not have included a proper measure to gauge group effectiveness. For example, none of the measures of effectiveness looked at the process of group interactions per se (e.g., communications flow). However, the multiple measures of group effectiveness did include objective output measures, measures of individual improvement, group influence on the individual, measures of individual changes, and the degree to which the group performed better than any of its members.

c. The NASA Moon Survival Task may not have been a test of group effectiveness in which LPC is a valid performance variable. Although the Contingency Theory maintains that LPC is universally relevant, the NASA exercise may have been too artificial to generate realistic group behavior.

d. The overall experimental situation may have lacked authenticity and realism. The classroom setting may not have generated group relationships allowing the LPC variable to be active. For example, astronauts in a field training exercise would have far more commitment and motivation to a viable solution to the problem than students in the classroom.

e. The experimental situation may have had unknown variables active which, for this situation, masked or dominated the effects of the LPC variable. Such variables might include the difference in military rank among the group members or professional specialty of the members (e.g., jet pilot, supply officer, surface warfare officer, etc.).

However, no systematic differences were noted upon examination of these factors.

f. The position power of the leader might have been too weak. Such a situation could have resulted in initially leaderless groups, and the emergent leaders may have had LPC's at variance with the intended composition of the group. Leaders and members with the "wrong" LPC's would prevent the investigator from analyzing the relationships and interactions he intended to examine, leading to inaccurate conclusions. In particular, in the academic setting of the Naval Postgraduate School, Ss were more likely to relate to each other as fellow students rather than as superiors and subordinates.

VI. CONCLUSIONS

From the results provided by this study, it may be concluded that among Naval officers, LPC is a dimension of an individual's personality which does not affect group atmosphere or the performance of small work groups.

A. CONSEQUENCES FOR MANAGEMENT THEORIES

If, in fact, the results reflect a true state of nature, what are the consequences to theories of managing groups?

1. LPC is not an important variable in creating groups and selecting group leaders.

2. While it may be popular folklore that "birds of a feather flock together," or, "opposites attract," similarities and dissimilarities along the LPC dimension appear to have no impact on group performance.

3. If these results on LPC could be generalized to other personality traits, general concepts akin to task-orientation and consideration, contrary to popular belief, may not be important factors to be considered when forming work groups.

4. Experimental situations may differ so greatly from real-life work settings that laboratory results relating to group performance have little or no useful significance for the line manager.

5. There may be factors other than LPC, inadequately defined at this time, which have greater impact on group performance.

Alternatively, the experimental results support no definitive conclusions. It may be that the experimental design and implementation were not sufficiently powerful to capture any significant relationships.

B. FUTURE RESEARCH

From the experience of performing this study, the following suggestions concerning the investigation of leader-member interactions are made:

1. Perform the experiment with the same personality attribute (LPC), but use a different task. To simplify effectiveness measures, the task should have an easily quantifiable performance measure. Navigation tests, such as that used in Fiedler's Belgian Navy study [Fiedler, 1966; 1967, p. 158-161], or anagram tests are examples of such measures.

2. Perform the experiment with the same task and measures of effectiveness, but examine personality factors other than LPC. Examples of personality traits which could be examined are consideration-initiating structure, authoritarianism-democracy, dominance-submissiveness, or active-passive.

3. Perform the experiment with the same task, measures of effectiveness, and personality attributes, but alter the implementation and part of the design. For example:

a. Increase or decrease the time allotted to the group consensus phase.

b. Select subjects from different populations, enlisted men, civilians, and/or include a greater percentage of women.

c. Construct the groups not only according to the personality trait factor, but also along "natural" groupings.

1) Naturally occurring work groups such as divisions aboard Navy ships, aircraft maintenance crews, or boot camp training companies.

2) Groupings according to equality of rank or rates.

3) Groupings according to work specialties such as supply officers, electronic technicians, civil engineers, or yeomen.

d. Increase the position power of the group leader. If position power were increased significantly and the task structure were kept constant, the overall situational favorableness would become moderately favorable (Fiedler's Octant III) or unfavorable (Octant VII).

C. COMMENTS

In conclusion, the ultimate objective of this study, to show that characteristics of followers are at least as important as the characteristics of leaders in affecting group performance, was not demonstrated. Although there was no significant performance differences among groups based on leaders' characteristics and followers' characteristics,

neither was there any significant difference in group performance. Although this result shows characteristics of leaders and members to be equally unimportant, the absence of any significant difference along any of the measure dimensions weakened this basic conclusion considerably. It is clear that additional investigation needs to be performed. It is hoped that this initial study provides clearer insights, and more specific direction for future research.

APPENDIX A

NASA MOON SURVIVAL TASK

Background:

Think of yourself as a member of a space crew whose mission is one of rendezvousing with a Mother Ship on the lighted surface of the moon. Due to mechanical difficulties, your ship has crashlanded some 200 miles from the rendezvous site. All equipment, with the exception of 15 items, was destroyed in the crash.

Your crew's survival depends on reaching the Mother Ship, so you must choose the most critical items available for the 200 mile trip. Your task is to rank the 15 items, listed below, in terms of their importance for survival. A separate answer sheet is provided.

ITEMS

Box of matches

Food concentrate

Fifty feet of nylon rope

Parachute silk

Solar-powered portable heating unit

Two .45 caliber pistols

One case of dehydrated Pet milk

Two one-hundred pound tanks of oxygen

Stellar map (of moon's constellation)

Self-inflating life raft

Magnetic compass

Five gallons of water

Signal flares

First aid kit containing injection needles

Solar powered FM receiver-transmitter

APPENDIX A
VERBAL INSTRUCTIONS

The way in which people work together and arrive at consensus decisions is of interest to leaders and to people who often work on committees and other types of small groups. You have been randomly assigned to work groups and a group administrative coordinator has been arbitrarily selected.

The task that your group will be working on is similar to a case study in that you are presented with a situation and then required to solve a particular problem based on the information provided about the situation. We are not able to answer any questions about the situation or provide any other data. If you think that assumptions are required, you might note them as you complete your solutions.

The exercise involves three phases:

1. in which you will individually and independently develop your own answer.

2. in which you will work together in your work with the exercise to come up with a group consensus, and

3. in which you again will work the exercise independently, but now with ideas developed by the group.

There may be an observer in your group. Observers are strictly forbidden to participate. They are to observe the group process in order to provide feedback at the end of the class and evaluation of the group interactions. At the end of the period today, there will be time to discuss and analyze the problem.

APPENDIX B

NASA Moon Survival Task

Ranking

Name _____

Group Number _____

Class Instructor _____

The 15 items left intact after the crash are listed below. You are asked to rank these in order of their importance for insuring survival. Place the number "1" in the space by the item you feel is most critical; the number "2" by the second most important item; and so on through number "15" by the least important item.

Rank	Items	Pre / Group / Post
___	Box of matches	
___	Food concentrate	
___	50 feet of nylon rope	
___	Parachute silk	
___	Portable heating unit	
___	Two .45 caliber pistols	
___	One case dehydrated Pet milk	
___	Two hundred-pound tanks of oxygen	
___	Stellar map (of the moon's constellation)	
___	Life raft	
___	Magnetic compass	
___	Five gallons of water	
___	Signal flares	
___	First aid kit containing injection needles	
___	Solar powered FM receiver-transmitter	

Have you ever performed this particular exercise before? Yes No

APPENDIX C
LPC SCALE

Think of the person with whom you can work least well. He may be someone you work with now, or he may be someone you knew in the past. He does not have to be the person you like least well, but should be the person with whom you had the most difficulty in getting a job done. Describe this person as he appears to you.

Pleasant___:___:___:___:___:___:___:___Unpleasant
8 7 6 5 4 3 2 1

Friendly___:___:___:___:___:___:___:___Unfriendly
8 7 6 5 4 3 2 1

Rejecting___:___:___:___:___:___:___:___Accepting
1 2 3 4 5 6 7 8

Helpful___:___:___:___:___:___:___:___Frustrating
8 7 6 5 4 3 2 1

Unenthusiastic___:___:___:___:___:___:___:___Enthusiastic
1 2 3 4 5 6 7 8

Tense___:___:___:___:___:___:___:___Relaxed
1 2 3 4 5 6 7 8

Distant___:___:___:___:___:___:___:___Close
1 2 3 4 5 6 7 8

Cold___:___:___:___:___:___:___:___Warm
1 2 3 4 5 6 7 8

Cooperative___:___:___:___:___:___:___:___Uncooperative
8 7 6 5 4 3 2 1

Supportive___:___:___:___:___:___:___:___Hostile
8 7 6 5 4 3 2 1

Boring___:___:___:___:___:___:___:___Interesting
1 2 3 4 5 6 7 8

Quarrelsome___:___:___:___:___:___:___:___Harmonious
1 2 3 4 5 6 7 8

Self-assured___:___:___:___:___:___:___:___Hesitant
8 7 6 5 4 3 2 1

Efficient___:___:___:___:___:___:___:___Inefficient
8 7 6 5 4 3 2 1

Gloomy___:___:___:___:___:___:___:___Cheerful
1 2 3 4 5 6 7 8

Open___:___:___:___:___:___:___:___Guarded
8 7 6 5 4 3 2 1

APPENDIX C

Name_____

Branch of Service_____

Rank_____

Designator_____

Sex M F

Age_____

Curriculum_____Section_____

Course_____Instructor_____

APPENDIX D

GROUP ATMOSPHERE SCALE

_____
Name

_____
Group Number

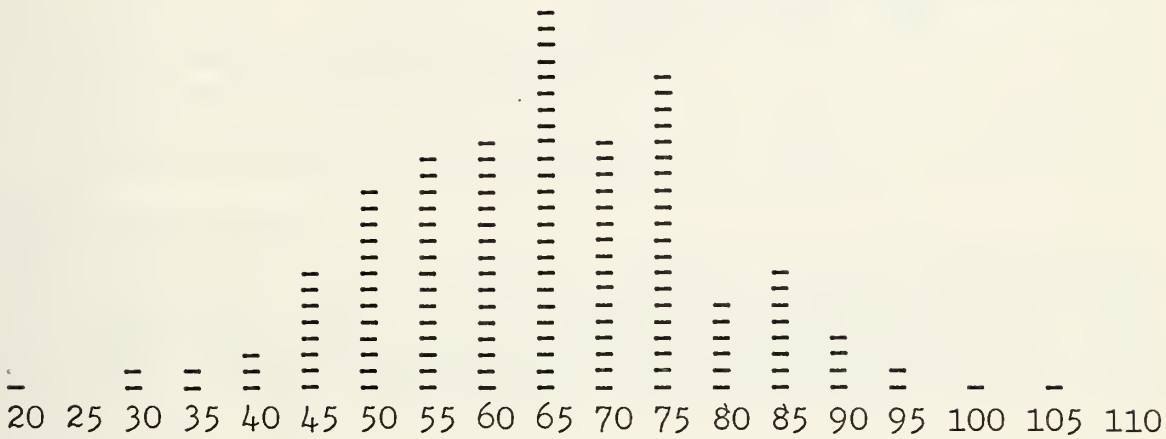
_____
Class Instructor

Describe your work group as it appears to you

Pleasant	8	7	6	5	4	3	2	1 Unpleasant
Friendly	8	7	6	5	4	3	2	1 Unfriendly
Bad	1	2	3	4	5	6	7	8 Good
Worthless	1	2	3	4	5	6	7	8 Valuable
Distant	1	2	3	4	5	6	7	8 Close
Cold	1	2	3	4	5	6	7	8 Warm
Quarrelsome	1	2	3	4	5	6	7	8 Harmonious
Self-assured	8	7	6	5	4	3	2	1 Hesitant
Efficient	8	7	6	5	4	3	2	1 Inefficient
Gloomy	1	2	3	4	5	6	7	8 Cheerful

APPENDIX E

LPC DISTRIBUTION



The mean of this distribution was 63.12 with a standard deviation of 14.3.

APPENDIX F

SUMMARY OF INDIVIDUAL AND GROUP SCORES

This appendix is a summary of the basic raw data used in this thesis. Inquiries concerning the original score sheets for individuals and groups may be directed to:

Dr. C. K. Eoyang, Asst. Prof.
Department of Operations Research and Administrative Science, Code 55Eg
U. S. Naval Postgraduate School
Monterey, California 93940

The data summary is arranged as follows:

1. Group number

2. Individuals in the group. Leaders are not specifically indicated, but, if in a high LPC-leader group, the individual with the highest LPC was designated leader. If in a low LPC-leader group, the individual with the lowest LPC was designated leader.

3. Score Columns

   a. Column 1: r NASA is the correlation of the group consensus ranking with the NASA ranking.

   b. Column 2: r Pre/Post is the correlation of the individual's pre-ranking with his post-ranking.

   c. Column 3: r Pre/Group is the correlation of the individual's pre-ranking with the group consensus ranking.

   d. Column 4: r Pre/NASA is the correlation of the individual's pre-ranking with the NASA ranking.

   e. Column 5: r Post/Group is the correlation of the individual's post-ranking with the group consensus ranking.

   f. Column 6: r Post/NASA is the correlation of the individual's post-ranking with the NASA ranking.

g. Column 7: GA is the individual's group atmosphere score. The "sum" figure is the group mean.

h. Column 8: LPC is the individual's LPC score. The "sum" figure is the group mean.

APPENDIX F

SUMMARY OF INDIVIDUAL AND GROUP SCORES

		r NASA	r PRE/POST	r PRE/GRP	r PRE/NASA	r POST/GRP	r POST/NASA	GA	LPC
GROUP	1	.8107	X	X	X	X	X	X	HH
Subj	A	X	.6464	.6392	.5142	.8964	.6536	58	97
	B	X	.7642	.6571	.5071	.9429	.8429	65	71
	C	X	X	X	X	.9857	.8321	75	83
	D	X	.9428	.9464	.7000	.9964	.8250	73	64
Avgs		.8170	.7845	.7475	.5738	.9554	.7884	67.75	78.75
GROUP	2	.6928	X	X	X	X	X	X	HH
Subj	A	X	.7535	.0071	.3604	.2392	.6035	72	86
	B	X	.8464	.8286	.4500	.9643	.6679	61	87
	C	X	.9528	.9143	.7571	.9282	.7172	70	74
	D	X	.6036	.6036	.4286	1.0000	.6928	54	66
Avgs		.6928	.7891	.5884	.5065	.7829	.6829	64.25	78.25
GROUP	3	.9429	X	X	X	X	X	X	HH
Subj	A	X	.9071	.7857	.8786	.9143	.9214	50	86
	B	X	.6457	.6357	.7357	1.0000	.9429	69	75
	C	X	.5821	.5250	.5643	.9821	.9393	69	75
	D	X	.7571	.8025	.6857	1.0000	.9429	61	73
Avgs		.9429	.7230	.6872	.7161	.9741	.9366	62.25	77.25
GROUP	4	.9607	X	X	X	X	X	X	HH
Subj	A	X	X	X	X	1.0000	.9607	69	71
	B	X	.9536	.9536	.9571	1.0000	.9607	63	74
	C	X	.9036	.9071	.9321	.9857	.9536	60	70
	D	X	.8643	.8500	.7964	.9929	.9714	66	74
Avgs		.9607	.9072	.9036	.8952	.9947	.9616	64.5	72.25

		r NASA	r PRE/POST	r PRE/GRP	r PRE/NASA	r POST/GRP	r POST/NASA	GA	LPC
GROUP	5	.9000	X	X	X	X	X	X	HH
Subj	A	X	.7714	.7571	.7429	.9786	.8893	71	70
	B	X	.2679	.2714	.1679	.9964	.8929	67	74
	C	X	.9000	.8929	.6929	.9929	.8750	69	65
	D	X	.9000	.9179	.9071	.9750	.9214	61	70
Avgs		.9000	.7098	.7098	.6277	.9857	.8947	67.0	69.75
GROUP	6	.7107	X	X	X	X	X	X	HH
Subj	A	X	.8571	.8571	.5786	1.0000	.7107	66	105
	B	X	.8786	.8464	.7929	.9800	.6893	70	66
	C	X	.7321	.7321	.8679	1.0000	.7107	67	72
	D	X	.5750	.5750	.6000	1.0000	.7107	64	74
Avgs		.7107	.7607	.7527	.7099	.9950	.7054	66.75	79.25
GROUP	7	.5214	X	X	X	X	X	X	HH
Subj	A	X	.9857	.7893	.4464	.8232	.4857	60	67
	B	X	.2929	.3821	.7750	.9786	.5143	53	73
	C	X	.8393	.7143	.5286	.9143	.6821	58	71
	D	X	.8857	.6357	.7393	.8536	.7393	62	68
Avgs		.5214	.7509	.6304	.6223	.8924	.6054	58.25	69.75
GROUP	8	.7536	X	X	X	X	X	X	LH
Subj	A	X	.6036	.7393	.7357	.7607	.5036	58	33
	B	X	.5857	.4036	.4714	.6250	.5214	50	68
	C	X	.5214	.6607	.3607	.8821	.7286	57	66
	D	X	.9286	.6036	.4893	.7536	.6107	56	82
Avgs		.7536	.6598	.6018	.5143	.7554	.5911	55.25	62.25
GROUP	9	.9250	X	X	X	X	X	X	LH
Subj	A	X	.9107	.8679	.8393	.9429	.9607	67	38
	B	X	.8179	.8643	.7500	.9679	.8929	66	68
	C	X	.9464	.9429	.8643	.9929	.9071	63	89
	D	X	.9071	.8714	.8214	.9714	.9071	60	68
Avgs		.9250	.8955	.8866	.8188	.9688	.9170	64.0	65.75

		r NASA	r PRE/POST	r PRE/GRP	r PRE/NASA	r POST/GRP	r POST/NASA	GA	LPC
GROUP	10	.9429	X	X	X	X	X	X	LH
Subj	A	X	.7024	.7034	.6577	.9964	.9536	58	49
	B	X	.3000	.0964	.2429	.7143	.7500	68	73
	C	X	.9143	.8923	.9536	.9821	.9679	79	68
	D	X	.7179	.7189	.7607	1.0000	.9429	67	81
Avgs		.9429	.6587	.6028	.6537	.9232	.9036	68.0	67.75
GROUP	11	.8750	X	X	X	X	X	X	LH
Subj	A	X	.8929	.5857	.5679	.7571	.7750	64	84
	B	X	.5679	.5571	.3750	.9679	.8321	77	16
	C	X	.7714	.7393	.7571	.9679	.8679	67	85
	D	X	.6643	.6643	.6571	1.0000	.8750	73	64
Avgs		.8750	.7241	.6366	.5893	.9232	.8375	70.25	62.25
GROUP	12	.9250	X	X	X	X	X	X	LH
Subj	A	X	.9821	.9821	.9214	1.0000	.9250	70	77
	B	X	.8464	.8464	.8036	1.0000	.9250	65	74
	C	X	.7179	.7179	.6607	1.0000	.9250	70	27
	D	X	.7536	.7536	.8000	1.0000	.9250	69	71
Avgs		.9250	.8250	.8250	.7964	1.0000	.9250	68.5	62.25
GROUP	13	.6964	X	X	X	X	X	X	LH
Subj	A	X	.6821	.6821	.7429	1.0000	.6964	63	65
	B	X	.9714	.9714	.7357	1.0000	.6964	75	65
	C	X	.5643	.5643	.6143	1.0000	.6964	68	28
	D	X	.6036	.5321	.7000	.9571	.6535	54	72
Avgs		.6964	.7054	.6875	.6982	.9893	.6857	65.0	57.5

		r NASA	r PRE/POST	r PRE/GRP	r PRE/NASA	r POST/GRP	r POST/NASA	GA	LPC
GROUP	14	.7929	X	X	X	X	X	X	HL
Subj	A	X	.8143	.8143	.8143	1.0000	.7929	68	91
	B	X	.7143	.7143	.8214	1.0000	.7929	76	39
	C	X	.9786	.9786	.7464	1.0000	.7929	70	45
	D	X	.8786	.8857	.8571	.9964	.8000	67	54
Avgs		.7929	.8465	.8482	.8098	.9991	.7947	70.25	57.25
GROUP	15	.8036	X	X	X	X	X	X	HL
Subj	A	X	.8584	.8214	.6429	.9355	.7533	69	48
	B	X	.8607	.8714	.7929	.9964	.7679	76	77
	C	X	.7750	.7393	.7643	.9857	.7964	67	57
	D	X	.8571	.8500	.9321	.9786	.8071	70	54
Avgs		.8036	.8378	.8205	.7831	.9741	.7812	70.5	59
GROUP	16	.9500	X	X	X	X	X	X	HL
Subj	A	X	.9643	.9643	.8643	1.0000	.9500	76	81
	B	X	.7607	.7607	.7036	1.0000	.9500	67	59
	C	X	.9643	.9643	.9071	1.0000	.9500	80	56
	D	X	.8357	.8357	.7036	1.0000	.9500	70	60
Avgs		.9500	.8812	.8812	.7947	1.0000	.9500	73.25	64
GROUP	17	.9429	X	X	X	X	X	X	HL
Subj	A	X	.6500	.6500	.6857	1.0000	.9429	73	79
	B	X	.1750	.1750	.0857	1.0000	.9429	71	51
	C	X	.8357	.7750	.6429	.9643	.8964	54	39
	D	X	.6929	.6929	.6071	1.0000	.9429	77	46
Avgs		.9429	.5884	.5732	.5054	.9911	.9313	68.75	53.75

		r NASA	r PRE/POST	r PRE/GRP	r PRE/NASA	r POST/GRP	r POST/NASA	GA	LPC
GROUP	18	.5464	X	X	X	X	X	X	HL
Subj	A	X	.9960	.9854	.5927	.9929	.5929	65	81
	B	X	.8786	.9143	.4393	.9857	.5357	60	56
	C	X	.6734	.6199	.7571	.9681	.5111	39	51
	D	X	.8679	.7679	.6750	.9429	.6821	70	61
Avgs		.5464	.8540	.8219	.6160	.9724	.5805	58.5	62
GROUP	19	.6714	X	X	X	X	X	X	HL
Subj	A	X	.7071	.6821	.8930	.9893	.6961	74	79
	B	X	.5694	.5965	.9015	.9893	.6643	64	57
	C	X	.9536	.9500	.7036	.9964	.6571	61	61
	D	X	X	X	X	X	X	X	X
Avgs		.6714	.7434	.7429	.8327	.9917	.6725	66.3	65.67
GROUP	20	.8393	X	X	X	X	X	X	HL
Subj	A	X	.6679	.8679	.6750	.8676	.9714	56	83
	B	X	1.0000	.9107	.7357	.9071	.7357	62	49
	C	X	.9393	.9286	.8857	.9607	.8321	73	50
	D	X	.5179	.5429	.5357	.9250	.7357	54	53
Avgs		.8393	.7813	.8125	.7080	.9151	.8187	61.25	58.75
GROUP	21	.9464	X	X	X	X	X	X	HL
Subj	A	X	.8643	.8214	.7893	.9821	.9393	75	72
	B	X	.7607	.6750	.6464	.8821	.7821	53	57
	C	X	.9071	.9250	.9036	.9964	.9393	66	61
	D	X	.9179	.9179	.9071	1.0000	.9464	63	63
Avgs		.9464	.8625	.8348	.8116	.9652	.9018	64.25	63.25

		r NASA	r PRE/POST	r PRE/GRP	r PRE/NASA	r POST/GRP	r POST/NASA	GA	LPC
GROUP	22	.7929	X	X	X	X	X	X	LL
Subj	A	X	.7464	.6643	.7286	.8893	.6964	69	42
	B	X	.7429	.6607	.2750	.9607	.7250	58	45
	C	X	.8179	.8107	.6071	.9964	.7857	72	56
	D	X	.7679	.7643	.6393	.9964	.7857	65	56
Avgs		.7929	.7688	.7250	.5625	.9607	.7482	66.0	49.75
GROUP	23	.8821	X	X	X	X	X	X	LL
Subj	A	X	.8036	.8036	.7179	1.0000	.8821	67	44
	B	X	.9321	.9321	.8357	1.0000	.8821	80	51
	C	X	.9036	.9036	.8821	1.0000	.8821	68	56
	D	X	.8143	.6893	.6714	.9643	.8821	72	46
Avgs		.8821	.8634	.8322	.7768	.9911	.8821	71.75	49.25
GROUP	24	.6036	X	X	X	X	X	X	LL
Subj	A	X	.6536	.4786	.6893	.8750	.6179	65	52
	B	X	.4783	.4783	.4680	1.0000	.6036	72	57
	C	X	.9571	.9464	.5464	.9964	.5964	67	58
	D	X	.7679	.7429	.6179	.9929	.6464	60	63
Avgs		.6036	.7142	.6616	.5804	.9661	.6161	66.0	57.5
GROUP	25	.8714	X	X	X	X	X	X	LL
Subj	A	X	X	.7286	.5893	X	X	57	41
	B	X	.8750	.8750	.8250	1.0000	.8714	76	60
	C	X	.8571	.6786	.4929	.9214	.8000	61	55
	D	X	.8607	.8107	.7286	.9857	.8893	66	60
Avgs		.8714	.8643	.7732	.6590	.9690	.8536	65.0	54.0

		r NASA	r PRE/POST	r PRE/GRP	r PRE/NASA	r POST/GRP	r POST/NASA	GA	LPC
GROUP	26	.8357	X	X	X	X	X	X	LL
Subj	A	X	.8571	.8000	.8821	.9750	.8500	62	54
	B	X	.7714	.7750	.7179	.9964	.8107	79	59
	C	X	.8857	.8857	.8514	1.0000	.8357	65	61
	D	X	.6929	.7250	.6036	.9357	.8964	55	63
Avgs		.8357	.8018	.7964	.7638	.9768	.8482	65.25	59.25
GROUP	27	.4964	X	X	X	X	X	X	LL
Subj	A	X	.3286	.3286	.5679	1.0000	.4964	72	52
	B	X	.3107	.3107	.3107	1.0000	.4964	61	54
	C	X	.5036	.4393	.7500	.9071	.5536	60	57
	D	X	.7036	.6964	.4714	.9357	.5786	65	57
Avgs		.4964	.4616	.4438	.5250	.9607	.5312	64.5	55.0
GROUP	28	.7000	X	X	X	X	X	X	LL
Subj	A	X	.8250	.8107	.6821	.9786	.6893	68	42
	B	XX	.7536	.5036	.8875	.7786	.8893	65	62
	C	X	.7429	.7250	.5429	.9821	.6821	66	48
	D	X	.7286	.7286	.5000	1.0000	.7000	56	51
Avgs		.7000	.7625	.6920	.6531	.9348	.7402	63.75	50.75
GROUP	29	.9071	X	X	X	X	X	X	LL
Subj	A	X	.9429	.9500	.8143	.9964	.8964	61	48
	B	X	.9107	.9393	.9000	.9571	.8857	69	64
	C	X	.8179	.7071	.8643	.9536	.9643	60	62
	D	X	.7750	.7857	.7179	.9857	.8964	44	50
Avgs		.9071	.8616	.8455	.8241	.9732	.9107	58.5	56.0

		r NASA	r PRE/POST	r PRE/GRP	r PRE/NASA	r POST/GRP	r POST/NASA	GA	LPC
GROUP	30	.7964	X	X	X	X	X	X	LL
Subj	A	X	.7571	.7571	.8000	1.0000	.7964	70	44
	B	X	.9214	.8714	.8929	.9750	.8464	66	57
	C	X	.7750	.7750	.5857	1.0000	.7964	62	48
	D	X	.7429	.7486	.4714	.9893	.8000	65	49
Avgs		.7964	.7991	.7880	.6875	.9911	.8098	65.75	49.5

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